

CLAIMS

1. An optical head for recording a signal in an optical recording medium or reproducing a signal recorded in the optical recording medium,
5 the optical head comprising:
a light source;
an objective lens for focusing light emitted from the light source on the optical recording medium; and
a tilt-related-aberration correcting means for correcting an
10 aberration that occurs when the optical recording medium tilts,
wherein a driving amount of the tilt-related-aberration correcting means is varied according to information concerning a tilt of the optical recording medium and information concerning a substrate thickness of the optical recording medium.
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2. The optical head according to claim 1,
wherein the tilt-related-aberration correcting means is a means for tilting the objective lens.
- 20 3. The optical head according to claim 2,
wherein
the objective lens has a certain set numerical aperture (NA), and
a tilted amount of the objective lens is varied according to the substrate thickness of the optical recording medium.
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4. The optical head according to claim 1,
wherein the objective lens has a NA of not less than 0.7.
5. The optical head according to claim 1, further comprising a memory
30 in which information concerning the driving amount of the tilt-related-aberration correcting means that is necessary for correcting an aberration that occurs due to a tilt of the optical recording medium is stored, the driving amount being determined according to the information concerning the tilt of the optical recording medium and the information
35 concerning the substrate thickness of the optical recording medium,
wherein
information concerning the driving amount of the

tilt-related-aberration correcting means stored in the memory is retrieved according to the information concerning the tilt of the optical recording medium and the information concerning the substrate thickness of the optical recording medium, and

5 the tilt-related-aberration correcting means is driven according to the retrieved information.

6. The optical head according to claim 1, further comprising a tilt
10 detecting means for detecting information concerning the tilt of the optical recording medium.

7. The optical head according to claim 6,
 wherein the tilt detecting means comprises:

15 a second light source different from said light source;
 a focusing lens for focusing light emitted from the second
 light source on the optical recording medium; and
 a photodetector for detecting light reflected by the optical
 recording medium.

20 8. The optical head according to claim 6,
 wherein the tilt detecting means detects focus zero-crossing
 positions at two certain points in a radial direction of the optical recording
 medium, and detects a tilting amount of the optical recording medium based
 on a difference between values of a focus search voltage at the two points,
25 the focus search voltage being a voltage for detecting the focus zero-crossing
 position.

9. The optical head according to claim 1, further comprising a memory
30 in which information concerning the substrate thickness of the optical recording medium is stored.

10. The optical head according to claim 1, further comprising a
 substrate thickness detecting means for detecting information concerning
 the substrate thickness of the optical recording medium.

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11. The optical head according to claim 10,
 wherein the substrate thickness detecting means comprises:

a second light source different from said light source;
a focusing lens for focusing light emitted from the second
light source on the optical recording medium; and
a photodetector for detecting light reflected by the optical
recording medium.

12. The optical head according to claim 10,
wherein the substrate thickness detecting means detects the
information concerning the substrate thickness of the optical recording
medium according to focal positions of two light beams, the two light beams
being a first light beam on a side closer to an optical axis and a second light
beam on an external side as compared with the first light beam.

13. The optical head according to claim 1,
wherein
the tilt-related-aberration correcting means is formed with an
optical element, the optical element comprising a pair of substrates having
transparent conductive thin films, respectively, and a phase shifting layer
interposed between the pair of substrates, and
a pattern capable of correcting an aberration that occurs due to the
tilt of the optical recording medium is formed on one of the conductive thin
films.

14. The optical head according to claim 1, further comprising a
substrate-thickness-related-aberration correcting means for correcting an
aberration that occurs due to a deviation of the substrate thickness of the
optical recording medium from a standard value of the substrate thickness.

15. The optical head according to claim 14,
wherein the substrate-thickness-related-aberration correcting
means comprises:
a positive lens group and a negative lens group disposed in
an optical path; and
a means for varying a lens distance between the positive lens
group and the negative lens group.

16. The optical head according to claim 14,

wherein

the substrate-thickness-related-aberration correcting means is formed with an optical element, the optical element comprising a pair of substrates having transparent conductive thin films, respectively, and a
5 phase shifting layer interposed between the pair of substrates, and

a pattern capable of correcting an aberration that occurs relating to the substrate thickness of the optical recording medium is formed on one of the conductive thin films.

10 17. The optical head according to claim 14,
wherein

the tilt-related-aberration correcting means and the substrate-thickness-related-aberration correcting means are formed with one optical element, the optical element comprising a pair of substrates
15 having transparent conductive thin films, respectively, and a phase shifting layer interposed between the pair of substrates, and

a pattern capable of correcting an aberration that occurs relating to the substrate thickness of the optical recording medium is formed on one of the conductive thin films, and

20 a pattern capable of correcting an aberration that occurs due to the tilt of the optical recording medium is formed on the other conductive thin film.

25 18. The optical head according to any one of claims 13, 16, and 17,
wherein the phase shifting layer is made of liquid crystal.

19. An aberration correcting method for correcting an aberration that occurs when an optical recording medium tilts, by using an optical head for recording a signal in the optical recording medium or reproducing a signal
30 recorded in the optical recording medium, the optical head comprising:

a light source;

an objective lens for focusing light emitted from the light source on the optical recording medium; and

35 a tilt-related-aberration correcting means for
correcting an aberration that occurs when the optical recording medium tilts,

the method comprising the step of driving the tilt-related-aberration

correcting means according to information concerning a tilt of the optical recording medium and information concerning a substrate thickness of the optical recording medium.

- 5 20. An optical recording/reproducing device comprising an optical head for recording a signal in an optical recording medium or reproducing a signal recorded in the optical recording medium,

 wherein the optical head is the optical head according to any one of claims 1 to 18.

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Written Amendment
(Amendment based on Section 11)

To Commissioner of the Japanese Patent Office

1. Identification of the International Application
PCT/JP02/12884

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4. Object of Amendment: Claims

5. Contents of Amendment

(1) As shown in a separate sheet, we amend claim 1, claim 5 and claim 19.

6. List of appended documents

New pages 29, 30, 32 and 33, Claims